ADDITIONAL NOTES ON BOTRYCHIUM TENEBROSUM.

A. A. EATON.

(Plate 48.)

DURING the past season I have made a few additional observations on *Botrychium tenebrosum*, A. A. Eaton, and in making them public it seems advisable to incorporate them in a general description for the readers of RHODORA, so that they may familiarize themselves with this quite common but little known New England plant.

Botrychium tenebrosum (Plate 48) is a species found only in rich humus or leaf-mould, in deep moist shade. It is usually quite small, often thread-like, and fruiting even when covered by leaves, but sometimes growing to a height of 9 inches. Usually the plants are 3 to 4 inches high. They are yellowish green, very glabrous and shining when young, decumbent and stramineous when older, becoming thin and transparent when pressed. The sterile laminae are near the fertile, often overtopping them (Fig. 3). They are always simple with 2 to 8 distant, lunate, rarely incised lobes, the terminal usually retuse (Figs. 8, 9). The lobes are apparently never spread out flat, but are in the same position which they have in bud. The fertile lamina is usually simple, the large sporangia being sunk in the tissues of the broadened rachis. When the frond is compound, the ultimate segments are similar to the fruited segments of the sterile lamina, the rachis broad and leaf-like (Fig. 5).

It is apparently a northern species, being quite rare about North Easton and Brockton, Massachusetts, the southernmost point from which I have it. In southern New Hampshire and northern Massachusetts it usually is found in wet maple swamps, often in or around the depressions near sluggish streams in which leaves accumulate and decay. My first plants were growing in sphagnum. The sparse vegetation is often of *Onoclea sensibilis* and *Rhus Toxicodendron*, and it is often accompanied by *B. matricariaefolium* and *B. lanceolatum*, and even varieties of *B. ternatum*. In Maine, however, it appears to affect the mounds of humus in cedar swamps, farther from water.

As found in Madison, Maine, on July 2d last, it appeared to be more at home than farther south, as the plants were better developed and characteristic in appearance. It was also found to become

bulbous at the base and sheathed by the old remnants of stems as in *B. simplex*, which it also resembles in its general aspect and the size and markings of the spores, differing principally in having a simple lunate-segmented sterile lamina contiguous to the fertile, or at least above the middle of the stipe. The vernation is essentially that of *B. simplex*, both portions being erect, the very tip of the sterile flexed over the top of the fertile, but not bent down (Fig. 6). In a former paper[1] I have given its distinctive characters and shown it to be not *B. simplex* and later[2] I gave a detailed description. Mr. G. E. Davenport doubts the specific rank of this plant, regarding it as a depauperate *B. matricariaefolium*.[3] Both Prof. Underwood and I[4] replied to his criticisms, but it appears well in this place to give some of the chief points of difference between the species. In the accompanying plate Figures 1, 3, 4, and 5 represent pressed specimens of *B. tenebrosum*, natural size; while Fig. 2 shows a depauperate, but fruiting, specimen of *B. matricariaefolium*.

In vernation the buds of *B. matricariaefolium* are stout, the fertile lamina declined at the tip, resting on the top of the sterile of the succeeding year, the sterile of the year embracing the whole with its tip distinctly declined and enveloping the top of the fertile. In *B. tenebrosum*, on the other hand, the buds are much smaller even in plants of the same size, they usually bear a bulbous thickening of dead stalk-bases, and both segments are erect (Fig. 6), as in *B. simplex*. In habit *B. matricariaefolium* is relatively stout, erect, usually bluish as if pruinose, and has no remains of old stalks at the base; *B. tenebrosum* is slender and weak, shining, yellowish, and bears two or three years' accumulation of dead stalks. The aspect of the two is strikingly different when they are growing together.

The sterile lamina of *B. matricariaefolium* is more or less compound, the ultimate lobes being acute. Very rarely, indeed, a plant may be found, in which there are rounded lobes; the apex, however, is always acute (Fig. 10). In *B. tenebrosum* the sterile frond is essentially that of a very lax *B. lunaria*, although thinner and with the apex emarginate. In both species sporangia are borne on the sterile laminae, but in *B. matricariaefolium* they are usually on a transformed compound lobe, making a miniature spike, while in *B.*

[1] Papers Boston Meeting of Fern Chapter, 25.
[2] Fern Bulletin, VII. 7.
[3] Fern Bulletin, X. 22.
[4] l. c. X. 54.

tenebrosum they are always on the margin of the otherwise unaltered segment (Fig. 5). The differences in the sterile fronds are very noticeable even in the earliest stages of the plant.

The fertile lamina of *B. matricariaefolium* is decompound in full grown plants, the rachises are terete, the sporangia sessile or stalked, while in *B. tenebrosum* the spike is usually simple, rarely once pinnate, the rachises are broad, the sporangia sessile in rows or groups on each side, apparently buried in the tissues in life (Fig. 3, 4).[1]

The spores of *B. matricariaefolium* are 308–396 μ, averaging 352 μ, covered with coarse tubercles or warts; those of *B. tenebrosum* are 396–528 μ, average 484 μ, and are finely verrucose. I have previously[2] shown that the bud is elevated each year sufficiently to counterbalance the aggregation of leaves. The older portion of what may be considered as the rootstock persists for several years, and I found several plants in Maine, in which new plants were forming adventitiously from the oldest remaining nodes.

AMES BOTANICAL LABORATORY, North Easton, Massachusetts.

EXPLANATION OF PLATE 48. Figs. 1, 3, 4, 5 are of dried specimens of *Botrychium tenebrosum*, A. A. Eaton, natural size; Fig. 2 is of an herbarium specimen of *B. matricariaefolium*, natural size. Specimens 1, 3, 5 were collected in Skowhegan, Maine; specimen 4 in Brocton, Massachusetts. Nos. 1, 3, 5 have the sterile segment spread out in pressing; no. 4 shows it conduplicate in characteristic manner. At a, Fig. 3, an adventive shoot, springing from a root, is seen. Fig. 6 shows the bud of *B. tenebrosum*, magnified; Fig. 7, that of *B. matricariaefolium*, less magnified. Figs. 8, 9 show the apices of sterile fronds of *B. tenebrosum*; Fig. 10, that of the *B. matricariaefolium* figured above. Figs. 6–10 were drawn with the camera lucida. The others were traced from specimens.

GAYLUSSACIA DUMOSA AND FRONDOSA IN NEW HAMPSHIRE: — A CORRECTION.— Owing to a curious and quite unaccountable mixture of labels and specimens a misstatement was made by me in RHODORA, III, 1901, 193–194 under *Gaylussacia dumosa*. The specimen sent me by Mr. Alvah A. Eaton was collected by him at Muddy Pond, Nottingham, New Hampshire on September 15, 1899. Mr. Eaton collected *Gaylussacia frondosa* at French's Pond, North Hampton, New Hampshire (the station I gave for *G. dumosa*) on June 20,

[1] Since writing the above I have seen Prof. Underwood's fine series of specimens, one of which is somewhat ternate and similar to *B. simplex*, var. *subcompositum*.

[2] Papers Boston Meeting of Fern Chapter, 26.